2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (WELDING AND METALWORK): GRADE 11 (TERM 1)

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

TERM 1	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10-11
CAPS TOPICS	**SAFETY (GENERIC)**		**TERMINOLOGY (SPECIFIC)**			**TOOLS (SPECIFIC)**			**PAT CONSOLIDATION**	**REVISION AND ASSESSMENT**
TOPIC, CONCEPTS, SKILLS AND VALUES	**Analyse the OHS Act and regulations where applicable to the following machines:** **HIV and AIDS Awareness** **Knowledge of basic first aid measures** ● Grinding machines (portable, bench and surface cutting (drilling machines, power saw, band saw) ● Shearing machines (manual and power-driven)	● Press machines ● Joining (arc, gas) ● Handling and usage of gas cylinders	**THE USE OF TEMPLATES:** ● Materials used for templates: Wood, cardboard, steel plate and hardboard ● Principle of simple setting out of the right angle and the application of Pythagoras theorem, the ratio of 45° and 60° right-angled triangles ● Use principles 3, 4 and 5 ● Standard cross-centres and benchmarks ● Transference of floor diagrams to templates ● Use of strip, flange and web templates for steel sections. Ordinary and brushed steel templates Use of coloured and lettered holes, instructions and conventional marks on templates	**THE APPLICATION OF ROOF TRUSSES:** **Calculations of:** ● Rise slope ● Pitch The layout of roof trusses, details of purlins, truss shoes, wall plates, expansion, and footing **CALCULATION OF COSTS:** ● Quantification from drawings ● Compiling of cutting lists ● Calculation of cost of roof trusses and lattice beams	**EXPLAIN THE FOLLOWING TERMS:** ● Deposited metal ● Fusion zone ● Gap ● Heat-affected zone ● Kerf ● Spatter ● Weld pool **WELDING SYMBOLS:** ● Fusion weld symbols ● Supplementary symbols	**The principles and functions of the following purpose-made tooling and equipment:** ● Stocks and dies (characteristics and drill sizes) ● Grinding machines (portable, bench) Cutting machines (drilling machines, power saw, horizontal band saw)	● Guillotine machine (manual and power-driven) ● Press machines ● Joining equipment (arc, spot, gas) ● Rolling machine	● Punch and cropper machine ● Plasma cutter ● Cut–off machine	**Making of a roof- truss**	**Assignment**
			Practical: ● Develop a roof truss using the given instructions and templates and by applying the theorem of Pythagoras							
RESOURCES (OTHER THAN TEXTBOOKS) **TO ENHANCE LEARNING**	OHS Act, safety signs in the workshop, first aid manuals, tools, equipment		Tools and equipment as mentioned above, calculator			Tools and equipment mentioned above				
SBA (FORMAL)	**PAT Phase 1 = 50 Marks (practical of safety & tools and equipment) and assignment** The legislation governing workplaces about the Occupational Health and Safety Act, Act 85 of 1993, as amended, read with the Hazardous Biological Agents Regulations. Section 8 (1) of the Occupational Health and Safety (OHS) Act, Act 85 of 1993. Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. Examples of safe work practices requiring regular hand washing or using alcohol-based hand rubs. Learners and teachers should always wash hands when they are visibly soiled and after removing any PPE. Keep safe distances and always wear a mask See the document on the workshop safety measures									

2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (WELDING AND METALWORK): GRADE 11 (TERM 2)

TERM 2	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10-11
CAPS TOPICS	**FORCES (SPECIFIC)**			**MAINTENANCE (SPECIFIC)**	**JOINING METHODS**			**JOINING METHODS**	**PAT CONSOLIDATION**	**REVISION AND ASSESSMENT**
TOPICS, CONCEPTS, SKILLS AND VALUES	**FORCES:** Effects of forces, moments and torques on engineering components applying design principles Forces found in engineering components Determine graphically: **SYSTEM OF FORCES (Bows notation)** ● Triangle of forces ● Polygon of forces ● Resultant and equilibrant **PRACTICAL:** Determine graphically the magnitude of forces found in engineering components using the triangle of force, polygon of forces and resultant forces	**Moments:** Moments found in engineering components (By calculation only): Law of moments: Sum of LHM=Sum of RHM A supported beam with TWO vertical point loads acting on the beam with two supports The calculation of shear force and bending moment diagram and graphically illustrated **PRACTICAL:** Do calculations on moments of force found in engineering components	**STRESS AND STRAIN (Calculations of)** ● Stress and strain (Hooke's law) ● Compressive and tensile stresses ● Young's modulus of elasticity (ignore the factor of safety) ● Determine the change in length ● Stress and strain diagram **PRACTICAL:** Do calculations on stress and strain as indicated	**Identify causes of malfunction of guillotine, roller, punch and shearing machines**: ● Lack of lubrication or incorrect lubrication ● Overloading ● Friction ● Balancing **PRACTICAL:** Analyse and predict the outcome of the lack of maintenance on equipment used in the workshop	**Identify the application and uses of the following processes:** ● Gas welding ● MIG welding **PRACTICAL**: Apply the theoretical knowledge in performing welding processes to produce a project using oxy-acetylene, and MIG, MAGS welding	**Apply the welding process to CARBON STEEL:** ● The heating and cooling cycle ● To control the hardness ● Preheating and tempering	**The use and application of SPOT (Resistance) WELDING:** Description of process ● Current ● Electrodes ● Time cycle ● Maintenance and care of electrodes' tips	**Identify defects in welds, the causes and remedies for:** ● Blow holes ● Porosity ● Incomplete penetration ● Undercutting ● Weld crater ● Restarts ● Slag inclusion ● Cracks **PRACTICAL:** Identify defects from different welds, the causes and remedies	Welding joints and spot welding	Control Test
RESOURCES TO ENHANCE LEARNING	YouTube videos, force board, forces training kits, whiteboard or chalkboard, calculators			Prescribed workshop machines and videos	Gas, MIG spot welding			Workpieces with different weld defects		
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2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (WELDING AND METALWORK): GRADE 11 (TERM 3)

<table>
<tr><th>TERM 3</th><th colspan="2">WEEK 1</th><th colspan="2">WEEK 2</th><th colspan="2">WEEK 3</th><th>WEEK 4</th><th>WEEK 5</th><th>WEEK 6</th><th>WEEK 7</th><th>WEEK 8</th><th>WEEK 9</th><th>WEEK 10-11</th></tr>
<tr><td>CAPS TOPICS</td><td colspan="2">JOINING METHODS</td><td colspan="2"></td><td colspan="2">MATERIALS (GENERIC)</td><td colspan="5">TERMINOLOGY DEVELOPMENT (SPECIFIC)</td><td>PAT CONSOLIDATION</td><td>REVISION AND ASSESSMENT</td></tr>
<tr><td>TOPICS, CONCEPTS, SKILLS AND VALUES</td><td colspan="2">HEAT TREATMENT OF STEEL:

The changes in the structure of carbon steel during the heating-cooling processes

The iron-carbon equilibrium diagram:
● The temperature range of 500-900℃
● Carbon content between 0% and 1.4%

PRACTICAL:
Apply knowledge of heat treatment in performing the tempering process on a cutting tool
Apply knowledge of heat treatment in performing the normalising process on a tempered cutting tool</td><td colspan="2">Description of the purpose and methods for the following:
● Annealing
● Normalising
● Hardening
● Tempering
● Case hardening</td><td colspan="2">Function and uses of the following equipment during the manufacturing of steel:
● Blast furnace – refining of iron ore
● Bessemer converter
● Electric arc furnace
Distinguish between the following properties of engineering materials:
● Hardness
● Plasticity
● Elasticity
● Ductility
● Malleability
● Brittleness
● Toughness</td><td colspan="5">TRANSFORMATIONS BETWEEN PARALLEL HORIZONTAL PLANES:

Square to square | Square to round | Cones on and off centres Oblique cones with top and base parallel to the horizontal plane | Right cylindrical Y-connections

PRACTICAL:
Apply the knowledge gained on development to produce TWO transformations between parallel horizontal planes and a right cylindrical Y-connection</td><td>Construct and make developments</td><td>Control Test</td></tr>
<tr><td>RESOURCES (OTHER THAN TEXTBOOKS) TO ENHANCE LEARNING</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">Various bolts and nuts, thread gauges, thread charts, etc.</td><td colspan="5">Videos and materials on which to test the properties</td><td colspan="2"></td></tr>
<tr><td>SBA (FORMAL)</td><td colspan="9">PAT Phase 3 Practical of Development) and Term Test
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2023/24 ANNUAL TEACHING PLANS: MECHANICAL TECHNOLOGY (WELDING AND METALWORK): GRADE 11 (TERM 4)

TERM 4	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6-7	WEEK 8-11
CAPS TOPICS	**TERMINOLOGY: STEEL SECTIONS (SPECIFIC)**			**PAT CONSOLIDATION**		**REVISION AND ASSESSMENT**	
TOPICS, CONCEPTS, SKILLS AND VALUES	**Knowledge of steel sections such as:** ● Angle sections ● Channel sections ● I-beam sections referring to: ➢ Identification of the profile of the sections ➢ Uses of different sections **Joining the different sections practical:** Identify different types of steel sections as used in steel structures around the school or nearby buildings						**Examination**
RESOURCES (OTHER THAN TEXTBOOKS) **TO ENHANCE LEARNING**	Steel profile pieces from hardware or industry, videos and YouTube videos			Previous question papers and notes			
SBA (FORMAL)	**PAT Phase 3 Practical of Development) and FINAL EXAMINATION** **The legislation governing workplaces about COVID – 19 is the Occupational Health and Safety Act, Act 85 of 1993, as amended, read with the Hazardous Biological Agents Regulations. Section 8 (1) of the Occupational Health and Safety (OHS) Act, Act 85 of 1993, Safe work practices are types of administrative controls that include procedures for safe and proper work used to reduce the duration, frequency, or intensity of exposure to a hazard. Examples of safe work practices for SARS-CoV-2 include regular hand washing or using alcohol-based hand rubs. Learners and teachers should always wash hands when they are visibly soiled and after removing any PPE. Keep safe distances and always wear a mask. See the document on the workshop safety measures**						